

A REVIEW ON BOX PUSHING TECHNIQUE

Priyanka M. Rajput¹, Omkar A. Phatak², Devendra J. Sawant³, Jay P. Digaskar⁴,
Omkar C. Shinde⁵, Yashraj B. Mahind⁶

¹Professor of Civil Engineering,

²⁻⁶Student of Civil Engineering.

Department of Civil Engineering, Muchhala Polytechnic, Thane(W), Maharashtra, India.

Abstract - The project entitled analysis and design and execution of cross traffic works in railways using box pushing technique (RUB), illustrate about the work to be carried out for the widening of existing roads using box pushing techniques for rail under bridges. It also explains about the methodology involved in execution of box pushing technique. The design will be carried out as per Indian Standards, particularly Indian railway standards, IRC, IRS, IS CODES. In which design of major components thrust bed, precast box used for the widening are done as per IRS codes. The design of pre cast box is done using STADD PRO, it also includes the layout of reinforcement details of two important structures used in method apart from conventional methods i.e. thrust bed (main bed and auxiliary bed), pre cast box.

Keywords: Cross Traffic Works, Box Pushing technique (RUB), IRC, IRS, IS CODES

1. INTRODUCTION

Apart from being an embryonic source of accidents & fatalities Level Crossings are the nation. This fact has been understood by one and all Railway men. As such as an alternative for the compliance of the Codal /Railway Act provisions of facilitating the public to cross the track, IR has decided to construct a RUB/ROB to eliminate the LC gates. As the volume of the work is quite hefty, a strategy has to be decided for the implementation of the decision taken by the MR in his budget speech, (and the Railway Board accordingly). Major chunk of the work is the construction of RUB. Jacked box tunneling is a non-intrusive method of constructing a new under-bridge, culvert or subway beneath existing surface infrastructure, for example railways and highways. The method enables traffic flows to be maintained throughout the construction period, and maintained with only minor restrictions during brief period of tunneling. The inconvenience and costs of disruption to infrastructure and traffic flows experienced can be avoided by using traditional construction methods.

2. Collection of site data.

There are two basic materials used for making transparent concrete, one is from construction field and another from sensing field. First, concrete is one of the most important

civil engineering materials with the advantages of rich raw materials, low cost and simple production process and second the optical fiber has good light guiding property which can be arranged to transmit the light and the sun light transmit according to pre-design road without light-heat, light-electrical or photochemical process, and photo elastic effect which can be used to study the stress distribution of structures.

3. METHODS

- Box pushing method.
- Cut and cover method
- RH girder method

3.1 PRE-WORK

- All the S & T cables were protected before starting box pushing work.
- Imposed 20kmph speed restrictions + OES and stop dead if required.
- Isolation of track by cutting rail at 10m away from center line of box either side.
- Soil to be removed which is accumulated adjacent to the box.
- Proper lightning arrangement with DG set at 10KV kept ready at site.
- Making rail cluster.
- Marking centerline on top of boxes.
- 1500nos of ballast bags and 500no of sand bags kept ready at site.
- Wooden chalk / wooden sleepers 20nos kept ready at site.
- C.C crips 30nos kept ready at site.

3.2 STAGES

3.2.1. Excavation:

- The site is excavated to a certain calculated depth below ground level so that box provides enough clearance for a vehicle to pass through and road is in gradient 1 in 40.

- Generally the excavation is done by manually or mechanically using hydraulic excavator.
- The site having hard rock strata then excavation is done by blasting or chiseling.
- Chiseling costly and time taking process it is done only when the excavation is done in highly populated area where blasting is not possible or safe.



- Leading segment (First RCC Box segment) is cast over well set and leveled thrust bed.
- Concrete grade is generally kept as M35. 2.2 Cement Concrete



3.2.4 Pushing Operation Of Box :

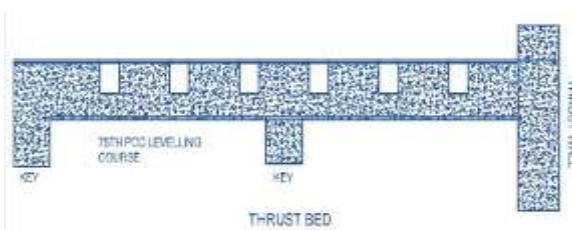
- To form horizontal opening below ground pushing of box is done by providing precast units underground without disturbing overhead amenities like structures & traffic.
- A thin film of grease and thick gauge plastic sheets is provided between top of the thrust bed and bottom of the box to avoid frictional resistance. This is done before casting of bottom slab of the box.
- Where soil is of poor quality drag sheet system is also considered for least resistance of friction
- With the process of jacking the front unit is pushed into the embankment and then excavation is done either manually or mechanically.
- Generally the average rate of pushing of box is 1 meter in 24 hrs to ensure safety.

3.2.4 Foundation of the road

- Once the pushing of box is done, the constructed road is open for traffic.
- The road is made up of bituminous or concrete.

3.2.2 Laying of Thrust Bed:

- It is one of the important stage in box pushing technique.
- It counters the reaction force from hydraulic jack and transfer it into the soil, therefore providing thrust bed is required to push the box into embankment.
- Provision for Jacking support is made by providing suitable pockets in the bed to accommodate pin supports. On completion of Jacking the thrust bed is utilized as floor bed , and so it is left in place.



3.2.3 Casting of RCC box

- The precast box is cast in segments of convenient length.
- The section of the box is designed as IRS codes of practice for 25 T loading 2008.



- Work must be done under block protection/caution order only.

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5. CONSEQUENCES

5.1 Advantages

- Non-disruption to rail traffic.
- It has a better quality control.
- It is economical.
- Time of completion is less.
- It saves man power and Machinery.
- It does not involves crane and heavy equipment .
- Less involvement of other Departments

5.2 Disadvantages

- Needs trained staff and skilled supervision.
- Imposition of caution order exist for a longer period .
- No scope of night working.
- Once the vertical & lateral alignment of box disturbed it becomes almost impossible to rectify it.
- It is difficult to construct in hard rock strata.

6. CONCLUSIONS

- Box pushing work means at least partly working in blind, so problems usually come up during execution of work
- Box pushing work require close supervisions and monitoring and quite often the unsafe conditions develop at these sites.
- Track must be watched regularly to see signs of having, settlement, misalignment etc.
- Long Welded Rail (LWR) must be cut and site isolated during box pushing